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APPARATUS FOR GRINDING MULTIFOCAL LENS

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ABSTRACT OF THE DISCLOSURE

This invention comprises an apparatus for making a multifocal lens which has no dividing lines between the separate areas of magnification. The apparatus obtains the multifocal result by grinding a single vision lens blank held at an angular relationship to a spinning chamois skin which has been coated with a grinding compound.

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment to me of any royalty thereon.

Multifocal lenses find use in a variety of applications and the apparatus herein described may be employed to produce multifocal lenses for many applications but the description will be directed primarily to multifocal contact lenses.

Previously, the bifocal or multifocal contact lenses have not been satisfactory because of the visible dividing line between the separate diopter areas caused by grinding these lenses on a lathe or formed lap. Even though these lenses were not satisfactory they were quite expensive to make because of the great amount of labor involved in accurately setting up a lathe to grind a particular lens. Other disadvantages of the lathe ground bifocal lenses are that patients complained of lenses not being comfortable, the lenses popped out, the patient's vision was not clear in that some objects looked curved, and that they felt insecure when walking.

Perhaps the cause of these disadvantages lie in the fact that there is a sharp boundary between the two different diopters in the lens. The boundary line is even more pronounced in contact lenses because these lenses are right next to the eye than in normal framed spectacles in which the bifocal line is spaced a distance from the eye. Persons who have been accumtomed to wearing single vision contact lenses have been unable to adapt to the lathe ground or formed lap ground bifocal lenses. In single vision contact lenses there is only one diopter for both near and far vision and there is no boundary line across which the eye has to shift.

This invention seeks to correct the disadvantages previously caused by bifocal, trifocal, or multifocal lenses, particularly contact lenses. This is done by producing a lens that has no boundary line and has a gradual feathering contour from one diopter to another.

An object of this invention is to provide apparatus for producing multifocal contact lens having a gradual feather taper between the different diopter areas.

Another object of this invention is to provide an apparatus for producing bifocal contact lenses from a single vision contact lens blank wherein there is no boundary line between the near and far vision areas.

FIG. 1 is a cross section of a multifocal lens showing an example of the positive diopters that can be incorporated in a lens;

FIG. 2 is a cross section of a multifocal lens showing an example of the negative diopters that can be incorporated in a lens;

FIG. 3 is a cross section view of a contact lens having a very large positive diopter in both the near and far vision areas; and

FIG. 4 is a perspective view of the lens grinding apparatus;

FIG. 5 is a side view of the hinge assembly on the lens grinding apparatus.

The lens

The term multifocal will be used throughout this specification to indicate that there is no sharp boundary between the separate diopter areas. In a sense the lenses shown in FIGS. 1, 2, and 3 are of the bifocal type, but this term is too limiting in that it implies that there are only two diopters throughout the entire contact lens. This is not true of the present invention because, in between the two main diopter areas there is a gradual taper from one diopter to the other. For instance, if the near correction is +5.00 diopters and the far correction is +3.00 diopters there would be an area of taper between the two. There might be one point between the near and far correction which had +3.50 diopters, another point with 4.00 diopters, and still another point with +4.50 diopters. Also, there would be a gradual taper between the above three mentioned diopters. For this reason, the lenses described in this application are more than mere bifocals having two areas of magnification of different power meeting in a distinct boundary line. The term multifocal has been chosen to more correctly describe the lenses and to include the tapering area between the two chosen diopters which in fact also has a diopter although this diopter is constantly changing as one progresses from one chosen diopter to the other.

FIG. 1 shows a typical contact len, which is of the cornea size as are all the lenses illustrated. It is not meant to limit this invention only to the grinding and producing cornea lenses which cover only the cornea, but the same process could be used for the larger type contact lenses.

Cornea type contact lenses are easily adapted to bifocal or multifocal production because this type of lens slides up and down as the eye is moved. For instance, when the wearer is looking straight ahead which would be distance viewing, he is looking through the center portion of the contact lens. The center area of the lens is ground to the wearer's far correction diopter. As the wearer's eyes drop such as in reading, the cornea contact lens comes in communication with the lower eyelid and is held from continuing movement with the cornea. When this happens the cornea type lens slides up with the relation to the cornea itself thereby causing the axis of view to be through the lower portion of the contact lens. Similarly, when the wearer's eyes are raised to gaze at a distant object, the lens will slide down in relation to the cornea and the center of view will again be through the center area of the lens. The cornea type contact lenses do not fit under the eyelid but instead cover only the cornea and are held on by surface tension of the tear covering of the eye. As the eye is moved up and down, the cornea lens will ride on this tear layer between the limits of the upper and lower eyelid. Closing of the eye or blinking is not affected by the cornea contact lens. Upon closing, the upper eyelid easily slides over the cornea lens.

FIG. 1 shows a typical cornea contact lens prescribed for a person needing bifocal lenses. As can be seen from the drawing the near correction is +5.00 diopters and the far correction is +3.00 diopters indicating that the patient sees better at a distance but not so well at near work such as reading. As was pointed out in the preceding paragraph, the cornea type contact lens works as follows. The wearer when gazing at distance such as when in driving an automobile has his axis of vision directed through the center of the lens and has a +3.00 diopter correction. Because of the outward bulge of the cornea area of the eye the lens is centered over this portion of the eye in distance viewing. When the wearer lowers his eyes such